Economics of the cultivation of *Salvia officinalis* and *Melissa officinalis*

Ekonomika pestovania šalvie lekárskej a medovky lekárskej

Ľ. Gurčík, R. Dúbravská, J. Miklovičová

Slovak University of Agriculture, Nitra, Slovak Republic

Abstract: The economic results show that the *Melissa officinalis* cultivation is economically effective and in comparison with the economic indicators of conventional crops planted on arable land, this herb achieves several times higher profit per hectare. The marginal costs of production are higher than its marginal revenues. Our research confirms that production of *Salvia officinalis* – sort Krajova and Comune is not profitable. The dominant factors that negatively affect the efficiency of growing this herb are low and unstable hectare yields on the one hand and high production costs on the other hand. Based on our research, it is possible to assume that the profit from production of *Salvia officinalis* was obtained only of the sort of Primorska and only through direct planting.

Key words: medical herbs, costs, profit, revenues, rentability

Abstrakt: Z ekonomických výsledkov vyplýva, že pestovanie *Melissa officinalis* je ekonomicky efektívne a v porovnaní s ekonomickými ukazovateľmi konvenčných plodín pestovaných na ornej pôde, táto liečivá rastlina niekoľkonásobne prevyšuje dosiahnutý zisk na hektár pestovateľskej plochy. Marginálne náklady vynaložené na vypestovanie a vysádzanie priesad sú vyššie než dosiahnuté marginálne tržby. Výsledky výskumu ďalej potvrdzujú, že pestovanie *Salvia officinalis* – odroda Krajová a Comune je stratové, ekonomicky nevýhodné. Dominantnými faktormi negatívne ovplyvňujúce ekonomickú efektívnosť pestovania tejto liečivej rastliny boli nízke a nestabilné hektárové úrody na jednej strane a vysoké pestovateľské náklady na strane druhej. Z výsledkov výskumu možno usúdiť, že zisk z pestovania *Salvia officinalis* bol dosiahnutý pri pestovaní odrodu Prímorská, avšak len v prípade, ak porast bol založený priamou sejbou.

Kľúčové slová: liečivé rastliny, náklady, zisk, tržby, rentabilita

INTRODUCTION

The medicinal herbs cultivation in the field condition is included among special sectors of plant production. At the present time, the medicinal herbs are cultivated mostly in the mountain and piedmont areas in Slovakia. In spite of the important social weight of these herbal kinds, they have never taken any significant portion in the market production. Currently small farms specializing on the medicinal herbs cultivation distribute their production to the pharmaceutical industry, or they process their production to the form of bulk tea or portioned tea (Porhajaš 2003).

The objective of the assignment was to carry out the economic analysis of Salvia cultivation (*Salvia officinalis*) and Melissa (*Mellisa officinalis*) in the form of economic information about production costs, revenues, economic result and rentability of production. Taking into consideration the fact that these herbs belong to the perennial herbs, whose growth foundation is connected with high costs, the cumulated profit/loss present value has been also included into this analysis (Bielik et al. 1996).

MATERIAL AND METODS

Information about costs of the chosen medicinal herbs production was taken from the evidence of the University Agricultural Company in Kolíňany (Haban 2004). It is important to mention that the costs in a different farming enterprise may take into consideration its actual production-economic and

subjective conditions, therefore they can differ. It does not refer only to the question of direct costs, but mostly question of the direct costs and administrative overheads (Černá 1998).

Economic evaluation of the medicinal herbs production was focused on the analysis of the following indicators (Gurčík 2004):

$$Economic\ result = revenues - total\ costs$$

and if

$$Revenues > total\ costs = profit$$

$$Revenues < total\ costs = loss$$

$$Rentability\ of\ costs = \frac{Pre\text{-}tax\ profit}{Total\ own\ costs} \times 100$$

$$Rentability\ of\ revenues = \frac{Pre\text{-}tax\ profit}{Revenues} \times 100$$

$$Costs\ demandingness\ of\ revenues = \frac{Total\ own\ costs}{Revenues} \times 100$$

$$Present\ profit\ value = \frac{Profit\ (loss)_t}{(1+r)^t} \times 100$$

r = discount interest rate representing the costs of capital evaluated as 0.05
t = order of cultivation year

In the case that the company was cultivating the above mentioned herb, its opportunity costs from different activities would be evaluated as 5%.

$$Total\ of\ the\ present\ profit\ value = \sum_{n}^{t=1} \frac{profit\ (loss)_t}{(1+r)^t}$$

Alternatives of the calculated economical indicators are show in Table 1.

RESULTS AND DISCUSSION

Mellisa officinalis

Total own costs of *Mellisa officinalis* cultivation-direct sowing in the first year with using the neat-house manure represent 76.310 Slovak crowns (SKK) per hectare, without neat-house manure 64 710 SKK per hectare. In the following years further cultivation costs are 51 040 SKK per hectare. If seedlings are planted, costs per hectare represent 268 590 SKK per hectare with neat-house manure and 256 940 SKK without neat-house manure in the first year (Table 2 to 5).

It is evident form the Table 5 that with the given costs, the realisation price 35 Slovak crowns per kg, as well as considering the achieved harvest, it is the most suitable to grow Melissa using the direct sowing, which was preceded by neat-house manure fertilisation. Within a time period of 5 years, the present value of economic result was +220,560 thousand SKK from 1 hectare, that represents on average 45 313 SKK, in comparison with other commonly cultivated crops incomparably higher. The lowest economical results are achieved during the growth foundation by young plants planting, without neat-house manure fertilising, where the aggregated present value of economic result from 1 hectare within a time period of 5 years presented 83 306 SKK (year average 16 661 SKK).

As we can see from the deeper analysis, seedling planting of Melissa brings on one hand higher harvest in comparison with direct sowing, but on the other hand fairly high costs connected with cultivating of seedlings and their sowing is the reason of economi-

Table 1. Alternatives of the calculated economic indicators

Way of growth foundation	Organic fertilisation	Realisation price
Direct sowing	neat-house manure	minimum realisation price
		maximum realisation price
	without neat-house manure	minimum realisation price
		maximum realisation price
Seedling plantation	neat-house manure	minimum realisation price
		maximum realisation price
	without neat-house manure	minimum realisation price
		maximum realisation price

Table 2. Cultivation costs of *Melissa officinalis* in Slovak crowns per hectare of cultivation area
Fertilized by neat-house manure – direct sowing

Cost item	Costs in the 1st year			Year cost 2nd–5th year	Total
	quantity	price	cost		
Fertilizing with neat-house manure					
Organic fertiliser cost	40	150	6 000		6 000
Manipulation and spreading of organic fertilizer	40	105	4 200		4 200
Deep tillage			2 000		2 000
Pre-plantation preparation of soil			1 050		1 050
Industrial fertilizer costs			3 000	3 000	15 000
Spreading of industrial fertilizer			300	300	1 500
Seeds consumption	4	2 000	8 000		8 000
Sowing			820		820
Chemical protection costs	4	1 800	7 200		36 000
Chemical protection application	4	430	1 720	1 720	8 600
Weeding	3	340	1 020	1 020	5 100
Manual hoeing			5 500	5 500	27 500
Collection and after collection harvest arrangement			25 800	25 800	129 000
Total direct costs			**66 610**	**44 540**	**244 770**
Indirect costs			9 700	6 500	35 700
Total costs			**76 310**	**51 040**	**280 470**

Source: Own planned calculation

Table 3. Cultivation costs of *Mellisa officinalis* in Slovak crowns per hectare of cultivation area
Fertilised by neat-house manure– seedling plantation

Cost item	Costs in the 1st year			Year cost 2nd–5th year	Total
	quantity	price	cost		
Fertilizing with neat-house manure					
Organic fertiliser cost	40	150	6 000		6 000
Manipulation and spreading of organic fertilizer	40	105	4 200		4 200
Deep tillage			2 000		2 000
Pre-plantation preparation of soil			1 050		1 050
Industrial fertilizer costs			3 000	3 000	15 000
Spreading of industrial fertilizer			300	300	1 500
Seeds consumption	55 000	2.65	145 750		145 750
Sowing	55 000	0.55	30 250		30 250
Chemical protection costs	4	1 800	7 200	7 200	36 000
Chemical protection application	4	430	1 720	1 720	8 600
Weeding	3	340	1 020	1 020	5 100
Manual hoeing			5 500	5 500	27 500
Collection and after collection harvest arrangement			25 800	25 800	129 000
Total direct costs			**233 790**	**44 540**	**411 950**
Indirect costs			34 800	6 500	60 800
Total costs			**268 590**	**51 040**	**472 750**

Source: Own measurements of the VEGA Project

Table 4. Production and revenues of cultivating *Melissa officinalis* per 1 hectare on cultivation area

Way of growth foundation	Organic fertilisation		Price per kg (SKK)	1st year	2nd year	3rd year	4th year	5th year	Total
Direct sowing	NHM	production (t)		1.59	3.00	3.98	3.70	3.3	15.57
		revenues (SKK)	35	55 650	105 000	139 300	129 500	115 500	544 950
		revenues (SKK)	45	71 550	135 000	179 100	166 500	148 500	700 650
	without NHM	production (t)		0.47	1.90	3.70	3.50	3.10	12.67
		revenues (SKK)	35	16 485	66 500	129 500	122 500	108 500	443 485
		revenues (SKK)	45	21 195	85 500	166 500	157 500	139 500	570 195
Seedling plantation	NHM	production (t)		1.88	4.05	4.13	4.00	3.80	17.86
		revenues (SKK)	35	65 800	141 750	144 550	140 000	133 000	625 100
		revenues (SKK)	45	84 600	128 250	185 850	180 000	171 000	803 700
	without NHM	production (t)		1.59	2.64	4.44	4.25	3.90	16.82
		revenues (SKK)	35	55 650	92 400	155 400	148 750	136 500	588 700
		revenues (SKK)	45	71 550	118 800	199 800	191 250	175 500	756 900

Source: Own measurements of the VEGA Project

Table 5. Final economic indicators in cultivating of *Mellisa officinalis* per one hectare within the time period of 5 years

Way of growth foundation	Organic fertilisation	Economic indicator	Measure unit	Realisation price per kg	
				35 SKK	45 SKK
Direct sowing	NHM	profit/loss	SKK	264 480	420 180
		rentability of costs	%	94.30	150
		rentability of revenues	%	48.53	59.97
		costs/revenues	%	51.47	40.03
		aggregate present value of profit	**SKK**	**220 565**	**353 596**
	without NHM	profit/loss	SKK	174 615	301 325
		rentability of costs	%	64.94	112.07
		rentability of revenues	%	39.37	52.85
		costs/revenues	%	60.63	47.15
		aggregate present value of profit	**SKK**	**139 683**	**246 448**
Seedling plantation	NHM	profit/loss	SKK	152 350	330 950
		rentability of costs	%	32.23	70.01
		rentability of revenues	%	24.37	41.18
		costs/revenues	%	75.63	58.82
		aggregate present value of profit	**SKK**	**107 326**	**260 324**
	without NHM	profit/loss	SKK	127 600	295 800
		rentability of costs	%	27.67	64.15
		rentability of revenues	%	21.67	39.08
		costs/revenues	%	78.33	60.92
		aggregate present value of profit	**SKK**	**83 306**	**226 272**

Source: Own measurements of the VEGA Project

cally inefficient way of growing. Total present value of the profit accumulated within 5 years of the herbal cultivation is in comparison with the direct way of sowing lower almost by 50%.

Salvia officinalis

Costs of *Salvia officinalis* cultivation by using the direct sowing do not change significantly. Costs per

Table 6. Cultivation costs of *Salvia officinalis* per one hectare of cultivation land in SKK
Young plant plantation – fertilizing with neat-house manure

Cost item	Costs in the 1st year			Year cost 2nd–5th year	Total
	quantity	price	cost		
Fertilizing with neat-house manure					
Organic fertiliser cost	40	150	6 000		6 000
Manipulation and spreading of organic fertilizer	40	105	4 200		4 200
Deep tillage			2 000		2 000
Pre-plantation preparation of soil			1 050		1 050
Industrial fertilizer costs			3 000	3 000	1 5000
Spreading of industrial fertilizer			300	300	1 500
Seedlings plantation costs	55 000	2.85	156 750		156 750
Seedlings plantation and watering	55 000	0.55	30 250		30 250
Chemical protection costs	4	1 800	7 200	7 200	3 6000
Chemical protection application	4	430	1 720	1 720	8 600
Weeding	3	340	1 020	1 020	5 100
Manual hoeing			5 500	5 500	27 500
Harvest and after harvest arrangement			25 800	25 800	129 000
Total direct costs			**244 790**	**44 540**	**422 950**
Indirect costs			36 719	6 500	62 719
Total costs			**281 509**	**51 040**	**485 669**

Source: Own measurements of the VEGA Project

Table 7. Production and revenues cultivating the *Salvia officinalis* per 1 hectare of cultivation area: cv. Krajová

Way of growth foundation	Organic fertilisation		Price per kg (SKK)	1st year	2nd year	3rd year	4th year	5th year	Total
Direct sowing	NHM	production (t)		0.86	1.62	1.24	1.10	1.00	5.82
		revenues (SKK)	40	34 320	64 960	49 600	44 000	40 000	232 880
		revenues (SKK)	50	42 900	81 200	62 000	55 000	50 000	291 100
	without NHM	production (t)		0.31	1.16	1.08	1.00	0.90	4.44
		revenues (SKK)	40	12 240	46 200	43 320	40 000	36 000	177 760
		revenues (SKK)	50	15 300	57 750	54 150	50 000	45 000	222 200
Seedlings plantation	NHM	production (t)		0.57	1.95	1.31	1.20	1.10	6.13
		revenues (SKK)	40	22 920	78 000	52 320	48 000	44 000	245 240
		revenues (SKK)	50	28 650	97 500	65 400	60 000	55 000	306 550
	without NHM	production (t)		0.65	1.55	1.15	1.00	0.95	5.30
		revenues (SKK)	40	26 120	62 000	45 840	40 000	38 000	211 960
		revenues (SKK)	50	32 650	77 500	57 300	50 000	47 500	264 950

Source: Own measurements of the VEGA Project

hectare during the growth foundation related to seedling planting represent 281.509 Slovak crowns using the neat-house manure, in the second year 51 040 SKK per hectare. Without fertilising with neat-house manure the costs are in the first year 271 115 SKK per hectare. A higher cost is the result of different internal costs of seedlings growing, as well as the result of administrative overheads (Table 6–12).

With reference to *Salvia officinalis*, it is clearly evident that with its costs, the mentioned realisation price and production parameters, which were achieved in this research, cultivation of Salvia of the variety "Krajová" is loss-making. The similar results are achieved in cultivation of the variety "Comune", where the loss is even higher. The reason of this situation is the low per hectare yield achieved.

Table 8. Production and revenues cultivating the *Salvia officinalis* per 1 hectare of cultivation area: cv. Comune

Way of growth foundation	Organic fertilisation		Price per kg (SKK)	1st year	2nd year	3rd year	4th year	5th year	Total
Direct sowing	NHM	production (t)		0.49	1.24	1.01	1.1	1.00	4.84
		revenues (SKK)	40	19 760	49 440	40 400	44 000	40 000	193 600
		revenues (SKK)	50	24 700	61 800	50 500	55 000	50 000	242 000
	without NHM	production (t)		0.35	0.95	1.05	1.00	0.90	4.25
		revenues (SKK)	40	14 000	37 880	42 000	40 000	36 000	169 880
		revenues (SKK)	50	17 500	47 350	52 500	50 000	45 000	212 350
Seedlings plantation	NHM	production (t)		0.64	1.38	0.98	1.10	1.00	5.10
		revenues (SKK)	40	25 400	55 200	39 200	44 000	40 000	203 800
		revenues (SKK)	50	31 750	69 000	49 000	55 000	50 000	254 750
	without NHM	production (t)		0.46	1.29	1.18	1.15	1.10	5.18
		revenues (SKK)	40	18 480	51 400	47 280	46 000	44 000	207 160
		revenues (SKK)	50	23 100	64 250	59 100	57 500	55 000	258 950

Source: Own measurements of the VEGA Project

Table 9. Production and revenues cultivating the *Salvia officinalis* per 1 hectare of hectare of cultivation area: Prímorská

Way of growth foundation	Organic fertilisation		Price per kg (SKK)	1st year	2nd year	3rd year	4th year	5th year	Total
Direct sowing	NHM	production (t)		0.55	2.06	1.37	1.25	1.20	6.43
		revenues (SKK)	40	22 000	82 520	54 640	50 000	48 000	257 160
		revenues (SKK)	50	27 500	103 150	68 300	62 500	60 000	321 450
	without NHM	production (t)		0.43	1.47	1.30	1.25	1.20	5.66
		revenues (SKK)	40	17 320	58 800	52 120	50 000	48 000	226 240
		revenues (SKK)	50	21 650	73 500	65 150	62 500	60 000	282 800
Seedlings plantation	NHM	production (t)		0.90	2.71	1.62	1.52	1.48	8.23
		revenues (SKK)	40	36 040	108 520	64 600	60 800	59 200	329 160
		revenues (SKK)	50	45 050	135 650	80 750	76 000	74 000	411 450
	without NHM	production (t)		0.67	2.12	1.54	1.40	1.30	7.03
		revenues (SKK)	40	26 880	84 800	61 520	56 000	52 000	281 200
		revenues (SKK)	50	33 600	106 000	76 900	70 000	65 000	351 500

Source: Own measurements of the VEGA Project

Table 10. Final economic indicators of *Salvia officinalis* cultivation per one hectare within the time period of 5 years: cv. Krajová

Way of growth foundation	Organic fertilisation	Economic indicator	Measure unit	Realisation price per kg	
				40 SKK	50 SKK
Direct sowing	NHM	profit/loss	SKK	–47 590	10 630
		rentability of costs	%	–16.97	3.79
		rentability of revenues	%	–20.44	3.65
		costs/revenues	%	120.44	96.35
		aggregate present value of profit	**SKK**	**–43 051**	**7 448**
	without NHM	profit/loss	SKK	–91 110	–46 670
		rentability of costs	%	–33.89	–17.36
		rentability of revenues	%	–51.25	–21
		costs/revenues	%	151.25	121.00
		aggregate present value of profit	**SKK**	**–81.897**	**–43 873**
Seedlings plantation	NHM	profit/loss	SKK	–240 429	–179 119
		rentability of costs	%	–49.50	–36.88
		rentability of revenues	%	–98.04	–58.43
		costs/revenues	%	198.04	158.43
		aggregate present value of profit	**SKK**	**–228 733**	**–175 798**
	without NHM	profit/loss	SKK	–263 315	–210 325
		rentability of costs	%	–55.40	–44.25
		rentability of revenues	%	–124.23	–79.38
		costs/revenues	%	224.23	179.38
		aggregate present value of profit	**SKK**	**–247 179**	**–201 331**

Source: Own measurements of the VEGA Project

Table 11. Final economic indicators of *Salvia officinalis* cultivation per one hectare within the time period of 5 years: cv. Comune

Way of growth foundation	Organic fertilisation	Economic indicator	Measure unit	Realisation price per kg	
				40 SKK	50 SKK
Direct sowing	NHM	profit/loss	SKK	–86 870	–38 470
		rentability of costs	%	–30.97	–13.72
		rentability of revenues	%	–44.87	–15.90
		costs/revenues	%	144.87	115.90
		aggregate present value of profit	**SKK**	**–78 942**	**–37 416**
	without NHM	profit/loss	SKK	–98 990	–56 520
		rentability of costs	%	–36.82	–21.02
		rentability of revenues	%	–58.27	–26.62
		costs/revenues	%	158.27	126.62
		aggregate present value of profit	**SKK**	**–88 908**	**–52 636**
Young plant plantation	NHM	profit/loss	SKK	–281 869	–230 919
		rentability of costs	%	–58.04	–47.55
		rentability of revenues	%	–138.31	–90.65
		costs/revenues	%	238.31	190.65
		aggregate present value of profit	**SKK**	**–264 809**	**–220 894**
	without NHM	profit/loss	SKK	–268 115	–216 325
		rentability of costs	%	–56.41	–45.52
		rentability of revenues	%	–129.42	–83.54
		costs/revenues	%	229.42	183.54
		aggregate present value of profit	**SKK**	**–253 189**	**–208 843**

Source: Own measurements of the VEGA Project

Table 12. Final economic indicators of *Salvia officinalis* cultivation per one hectare within a time period of 5 years: cv. Primorská

Way of growth foundation	Organic fertilisation	Economical indicator	Measure unit	Realisation price per kg	
				40 SKK	50 SKK
Direct sowing	NHM	profit/loss	SKK	–23 310	40 980
		rentability of costs	%	–8.31	14.61
		rentability of revenues	%	–9.06	12.75
		costs/revenues	%	109.06	87.25
		aggregate present value of profit	**SKK**	**–23 298**	**32 138**
	without NHM	profit/loss	SKK	–42 630	13930
		rentability of costs	%	–15.86	5.18
		rentability of revenues	%	–18.84	4.93
		costs/revenues	%	118.84	95.07
		aggregate present value of profit	**SKK**	**–40 399**	**8 000**
	NHM	profit/loss	SKK	–156 509	–74 219
		rentability of costs	%	–32.23	–15.28
		rentability of revenues	%	–47.55	–18.04
		costs/revenues	%	147.55	118.04
		aggregate present value of profit	**SKK**	**–155 507**	**–84 266**
	without NHM	profit/loss	SKK	–194 075	–123 775
		rentability of costs	%	–40.83	–26.04
		rentability of revenues	%	–69.02	–35.21
		costs/revenues	%	169.02	135.21
		aggregate present value of profit	**SKK**	**–188 098**	**–127 479**

Source: Own measurements of the VEGA Project

This is proved by economic results of the variety "Prímorská", which in comparison to the varieties "Krajová" and "Comune" had a considerably higher yield per hectare of the cultivated crop. The above mentioned variety achieves profit only in case of direct sowing. An average present value of the profit per year (with 50 SKK Slovak crowns for 1 kg of the dry mass) presented 7 465 SKK.

CONCLUSION

Direct sowing of Melissa that is preceded by neathouse manure fertilisation seems to be economically the most effective. Within the time period of 5 years, the aggregate present value of economic result is +220 560 SKK from 1 hectare, what represents in average 45 313 SKK, what is in comparison with other commonly cultivated crops incomparably higher.

Considering economic results of Salvia, the highest profit is reached only cultivating the variety "Primorská" in case of direct sowing, where the aggregate present value of economic result is 32 138 SKK. That was reached because of the highest per hectare yield of this variety.

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Contact address:

Doc. Ing. Ľubomír Gurčík, Ing. Regína Dúbravská, Ing. Jana Miklovičová, Slovenská poľnohospodárska univerzita v Nitre, Tr. A. Hlinku 2, 949 01 Nitra, Slovenská republika
e-mail: lubomir.gurcik@fem.uniag.sk; dubrika@yahoo.com; jmikli@pobox.sk